
TWO NEW SPECIES OF THE *LUPINUS LANATUS* COMPLEX¹

Ana Maria Planchuelo² and
David B. Dunn³

ABSTRACT

The *Lupinus lanatus* complex is a group of closely related species that grow in southeastern Brazil and northeastern Argentina. They are herbaceous, perennial or occasionally biennial plants with basal leaves in the juvenile plant simple or three-foliate, stipules 3–7 cm long or longer, and large flowers 15–20 mm long having the banner glabrous and well reflexed from the wings. Two species, *L. magnistipulatus* and *L. setifolius*, are described for the first time.

This group of species appears to be closely related and can be recognized by the large stipules 3–7 cm or more long and the presence of some simple or trifoliate leaves at the base of the juvenile plants. Completely developed leaves from adult plants have five or more leaflets. They are all herbaceous perennials or short-lived perennials, or occasionally function as biennials. The flowers are commonly 15–20 mm long and glabrous, with the banner well reflexed from the wings and the sides turned back. The calyx cup tapers into the pedicel without the gibbous enlargement that is commonly present in other lupines.

We are suggesting that this group of species forms a second lineage derived from *L. paraguariensis*, which is thought to be the origin of the group, since it possesses morphological characteristics reminiscent of the group, including that the juvenile leaves and the first leaf produced on the lateral branches are simple. Planchuelo & Dunn (1984) described *L. paraguariensis* as showing a transitional stage between simple- and compound-leaved species.

Lupinus lanatus has floccose lanate indument on both sides of the leaflets (see Fig. 1A). Vegetatively it has been described as forming perennial mats up to four feet in diameter in sand dunes, with new growth developing seasonally from the tips of the stems which survive under the sand. *Lupinus magnistipulatus*, described in this paper, is similar to *L. lanatus* in the perennial condition but has less lanate hair coating (see Fig. 1B), and as its name suggests, the former develops a much larger free tip on the stipules. *Lupinus setifolius*, also described in this paper, appears to be biennial. The large free tip of the stipules and the loss of the lanate indument (see Fig. 1C) suggest the latter as a derivative from *L. magnistipulatus*.

The species *L. multiflorus*, *L. albescens*, and *L. aureonitens*, treated by Planchuelo & Dunn (1984), are relatives of this complex. They have caespitose perennial habit and a narrow free tip of the stipules like *L. lanatus* but develop a much denser indument that grades from densely short-lanate to densely sericeous, completely hiding the leaf surface.

KEY TO THE SPECIES OF *LUPINUS LANATUS* COMPLEX AND RELATIVES

- 1a. Basal leaves and first leaf of each lateral branch simple, the others palmately compound *L. paraguariensis*
(description in Planchuelo & Dunn, 1984).
- 1b. All leaves of mature plants palmately compound, exceptionally with few basal simple leaves on juvenile plants.
 - 2a. Wing tips with an upturned toothlike tip.
 - 3a. Leaves primarily cauline; stems erect, branching above *L. albescens*
(description in Planchuelo & Dunn, 1984).
 - 3b. Leaves primarily basal; stems with branches primarily basal *L. aureonitens*
(description in Planchuelo & Dunn, 1984).

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² Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina, Facultad de Ciencias Agropecuarias, Casilla de Correo 509, Córdoba, Argentina.

³ University of Missouri-Columbia, 202 Tucker Hall, Columbia, Missouri 65211, U.S.A.

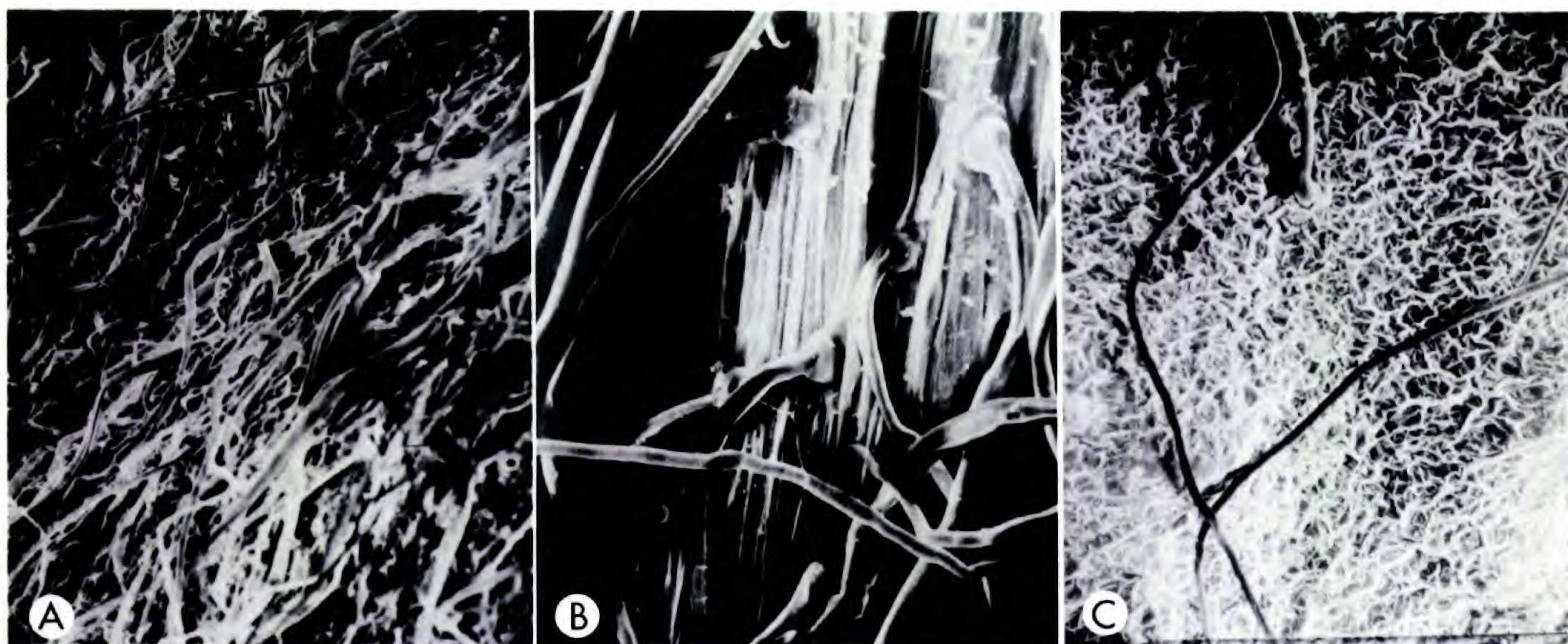


FIGURE 1. Indument of:—A. *L. lanatus*, leaflet ($\times 100$).—B. *L. magnistipulatus*, petiole ($\times 200$).—C. *L. setifolius*, leaflet ($\times 100$).

2b. Wing tips rounded, without a toothlike tip.

4a. Leaflets mostly broadly obovate or broadly oblanceolate with the tips rounded. Stipules foliaceous, with free portion ovate-lanceolate, 8–15 mm wide.

5a. Leaflets thinly floccose-lanate on both sides. Short-lived perennials 2. *L. magnistipulatus*

5b. Leaflets glabrous on both sides except for setaceous hairs on the midrib, major veins, and occasionally scattered along some areas of the margins. Biennials 3. *L. setifolius*

4b. Leaflets all narrowly elliptic to narrowly oblanceolate with tips acute or obtuse. Stipules not foliaceous, with free portion lance-attenuate, 2–5 mm exceptionally 6 mm wide.

6a. Leaflets abundantly floccose-lanate or thinly lanate, the larger 7–11 cm long. Stipules 3–8.5 cm long. Lower lip of the calyx often enlarging and foliaceous as fruit develops 1. *L. lanatus*

6b. Leaflets densely lanate to densely sericeous, the larger 4–5 cm long, rarely to 7 cm long. Stipules 1.5–2.6 cm long. Calyx not enlarging as fruit develops *L. multiflorus* (description in Planchuelo & Dunn, 1984).

1. *Lupinus lanatus* Benth. in Mart., Fl. Brasil.

15(1): 16. 1859. TYPE: Brazil. Rio Grande do Sul: *Herb. Imp. Bras. 1511*, not seen. Figure 2.

Plants perennial, herbaceous, 25–60 cm tall, in clumps to 1.5 m wide, possibly rhizomatous or the stems arising from underground branches; *stems* fistulose, 8–12 mm diam., first internode of branches 4–9 cm long, others 1–2 cm long, covered with soft tangled lanate hairs 4–5 mm long; *stipules* 3–8.5 cm long, commonly green like the leaflets, the free portion lance-attenuate, 3–5(6) cm long, 2–5(6) mm wide, with pubescence as on stems; *petioles* 5–22 cm long, lanate as stems; *leaflets* 5–7, oblanceolate, the tips obtuse or rounded, densely or thinly lanate on both sides, thinner above, the largest 7–11 cm long, 10–20 mm wide. *Peduncles* 2.5–8 cm long, fistulose, angular and lanate as the stems; *racemes* 15–50 cm long, flowers scattered, the rachis fistulose and lanate as stems; *bracts* caducous, lance-attenuate, 12–22 mm long, lanate dorsally, glabrous ventrally; *bracteoles* 3–5 mm long, lanceolate to lance-attenuate, attached just below the lips of the lateral sinuses

of the calyx; *pedicels* 1–2 mm long at anthesis, 4–6 mm long in fruit, lanate. *Calyces* lanate outside, glabrous within, the base tapering into the pedicel, lower lip 13–17 mm long, 3.2–4.5 mm wide, often enlarging and foliaceous as fruit develops, trifold, central tooth 2.5–4 mm long, lateral teeth 2–3 mm long, arching outward, upper lip 8–13 mm long, bifid, the slit 5.6–9 mm deep, the lobes 2.3–2.5 mm wide, the lips connate 3 mm; *banner* glabrous, oval-ovate, 15–17.5 mm long, including the 2–2.5-mm-long claw, 12–13.5 mm wide, appressed 4–6 mm, reflexed 12–13 mm, reflexed/appressed ratio 2.4, the angle 130°, the tip bluntly rounded; *wings* arcuate, 15.5–18.5 mm long, 6.5–7.5 mm wide, the claw 3.5 mm long, lobe above the claw 1.6–2.2 mm wide; *keel* arcuate glabrous, 4.5 mm wide in the middle, the tip arcing back in a continuous curve, no definite angle, 80–85°; *ovules* 8. *Legumes* ascending to erect, 5–9 cm long, 1–1.5 cm wide, shaggy lanate.

The floral parts, especially the calyx and the banner, are remarkably similar to those of *L. paraguariensis*. The Argentinian specimens and *Rambo 28195* from Rio Grande do Sul, Brazil, had

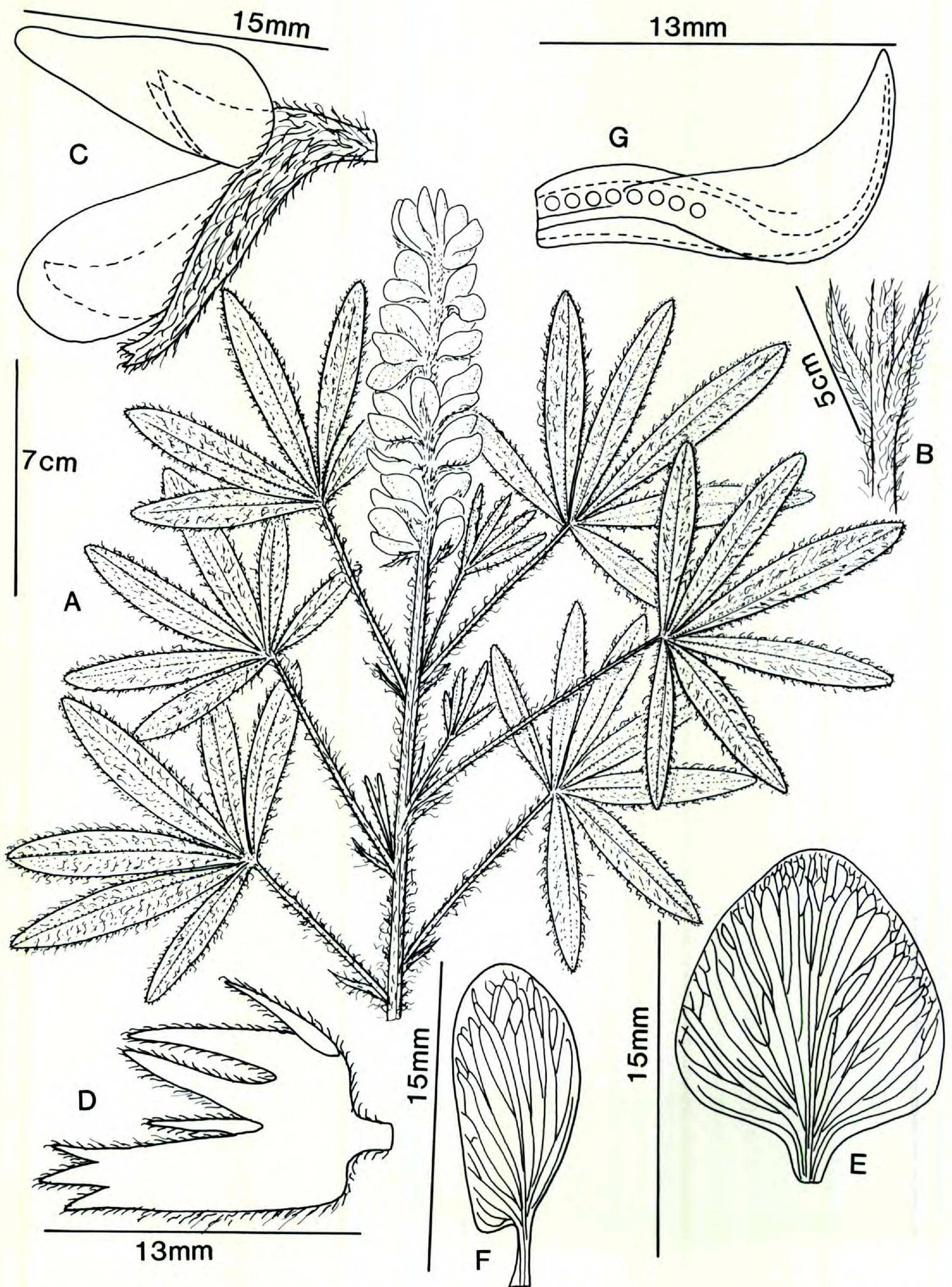


FIGURE 2. Illustration of typical structures of *Lupinus lanatus*. — A. Upper part of the plant with inflorescence. — B. Stipules detached at the node. — C. Lateral view of the left side of the flower. — D. Calyx, cut at the left lateral sinus and opened so that the inside surface shows. — E. Banner petal flattened, dorsal view. — F. Wing petal. — G. Keel petals, enclosing the staminal tube and the pistil, with the mean number of ovules drawn.

unusually large stipules, some of them 6 mm wide. All the others have most of the stipules under 5 mm wide. Although all the morphological characteristics of the large-stipuled specimens are those of the species, the enlargement of the free tip of the stipules suggests relationship with *L. magnistipulatus* and even crossing between the two species.

Lupinus lanatus occurs in the southernmost states of Brazil and in Misiones, Argentina. The plants are reported growing in open places and dunes.

Representative specimens examined. ARGENTINA. MISIONES: Campo Grande, *Bertoni 638* (LIL); Dep. Concepción, Concepción, *Schulz 6965* (LIL); Dep. San Javier, Parambí, collector's name illegible, *Inst. Miguel Lillo 188188* (LIL). BRAZIL: locality unknown, *Sello 3032* (NY, UC). RIO GRANDE DO SUL: Viera, near Rio Grande, *Archer 4303* (DS, K, NY, RB); S. Leopoldo, in dunes, *Henz 33899* (NY); Jacaré, *Rambo 38545* (MO); Apartados da Serra, próximo Capela dos Ausentes, *Pereira 6444* (NY); Nonvaí, Município de Sarandi, at flumen Alto Uruguai, *Rambo 28195* (LIL); Pareci Velho p. Cai, *Rambo 43841* (LIL, US).

2. *Lupinus magnistipulatus* Planchuelo & Dunn, sp. nov. TYPE: Brazil. Santa Catarina: Campos dos Padres, 1,900 m, *R. Reitz 2377* (holotype, SI; isotype, RB; photo, UMO). Figure 3.

Plantae perennes, 17–35 cm altae; caules erecti, fistulosi, pagina multis pilis patentibus, 4–7 mm longis ornata; stipulae virides foliaceae, 4–7 cm longae, parte adnata 1.2–2 cm longa, parte libera divergenti et ascendenti, 2–5 cm longa, 8–15 mm lata, lanata; petiolis 4–8.5(11) cm longi, lanati; folia (3)5–9-palmata, foliolis lanatis, oblanceolatis, apice rotundatis, 5–7 cm longis, 15–20 mm latis, complanatis; racemus major 20–30 cm longus, floribus diffusis; bractae foliolaceae, lanceolatae, apice acuminatae, 12–23 mm longae, 2.5–4 mm latae, in dorso lanatae; bracteolae 3.5–6 mm longae, 0.5–1.2 mm latae; flores calycibus in dorso lanatis, ventraliter glabris, labio inferiore triangulare, 10–16.6 mm longo, 3.5–4 mm lato, tridentato, dentibus 1.7–4.5 mm longis, lateralibus brevibus, labium superius 7–10.6 mm longo, bifido, incisura 5–7.8 mm profunda, lobis 2.5–3 mm latis; vexillum glabrum, ovatum, 15.5–20.6 mm longum, 9.7–15.6 mm latum, ungue 3.4–4.5 mm longo, parte reflexa 9–13.5 mm; alae 13–21 mm longae, 6.4–11 mm latae, ungue 3.3–4.5 mm longo; carina glabra, 3.4–5.5 mm lata; ovula 4–8; legumina lanata, immatura, 5 cm longa, 7 mm lata; semina non visa.

Plants short-lived perennials, 17–35 cm tall; stem erect, simple or with some basal branches, more often branching from the upper nodes after the first inflorescence, hollow, angular, to somewhat fistulose, covered with soft, spreading, tangled hairs 4–7 mm long; stipules 4–7 cm long, membranaceous, encircling ca. 40% of the stem cir-

cumference, 1.2–2 cm fused to the petioles, the free portion green, foliaceous, ovate-lanceolate, diverging away and ascending, 2–5 cm long, 8–15 mm wide, thinly lanate on both sides; petioles 4–8.5(11) cm long, lanate as the stems; basal juvenile leaves simple, the rest compound; leaflets (3)5–9, broadly oblanceolate, the tips generally rounded, lanate on both sides, the largest 5–7 cm long, 15–20 mm wide, mostly complanate at maturity. Peduncles 4–6 cm long on the primary inflorescence; racemes all immature on the primary inflorescences, 20–30 cm long, flowers scattered to subverticillate, the rachis lanate; bracts green, foliaceous, caducous, lanceolate, the tips acuminate, largest below, smaller above, 12–23 mm long, 2.5–4 mm wide, lanate dorsally; bracteoles lanceolate, 3.5–6 mm long, 0.5–1.2 mm wide, attached near or slightly below the lips of the lateral sinuses of the calyx; pedicels 2.6–5 mm long, ascending lanate. Calyces lanate outside, glabrous within, the lower lip triangular, 10–16.6 mm long, 3.5–4 mm wide, the tip trifid, the teeth 1.7–4.5 mm long, the laterals only slightly shorter, the upper lip 7–10.6 mm long, deeply bifid, the notch 5–7.8 mm deep, the lobes 2.5–3 mm wide, the lips connate 2.8–4.5 mm laterally; banners glabrous, ovate, 15.5–20.6 mm long, including the 3.4–4.5-mm-long claw, 9.7–15.6 mm wide, reflexed 9–13.5 mm, appressed 5.8–9.5 mm, reflexed/appressed ratio 1.45–1.6, the angle 127–144°; wings 13–21 mm long, 6.4–11 mm wide, the claw 3.3–4.5 mm long; keels glabrous, 3.4–5.5 mm wide in the middle, the angle 96–103°; ovules 4–8. Legumes shaggy lanate, immature, 5 cm long, 7 mm wide; seeds not seen.

The name *Lupinus magnistipulatus* was suggested several years ago by Prof. A. Burkart on herbarium specimens. Some of the specimens cited here were labeled by Burkart as a new species, *L. reitzii*. Our interpretation of the material is that these specimens are juvenile plants and do not differ otherwise from the others. Therefore we have not recognized *L. reitzii*.

The new species apparently grows only in southeastern Brazil in the states of Santa Catarina and Paraná at altitudes from 700 to 1,650 m. Flowering occurs from late October to late January.

Representative specimens examined. BRAZIL. PARANÁ: Mun. Guarapuana, Guara, *Hatchback & Guimaraes 20492* (NY, US). SANTA CATARINA: Mun. Bom. Retiro, Campos dos Padres, *Smith, Reitz & Klein 7703* (NY, US); *Smith & Reitz 10326* (US); Campos dos Padres, 1,900 m, *R. Reitz 2377* (holotype, SI; isotype, RB; photo, UMO); Mun. Joaqaba, Campo de Palmas, 52 km W of Caçador, *Smith & Reitz 9155* (SI, US); Mun.

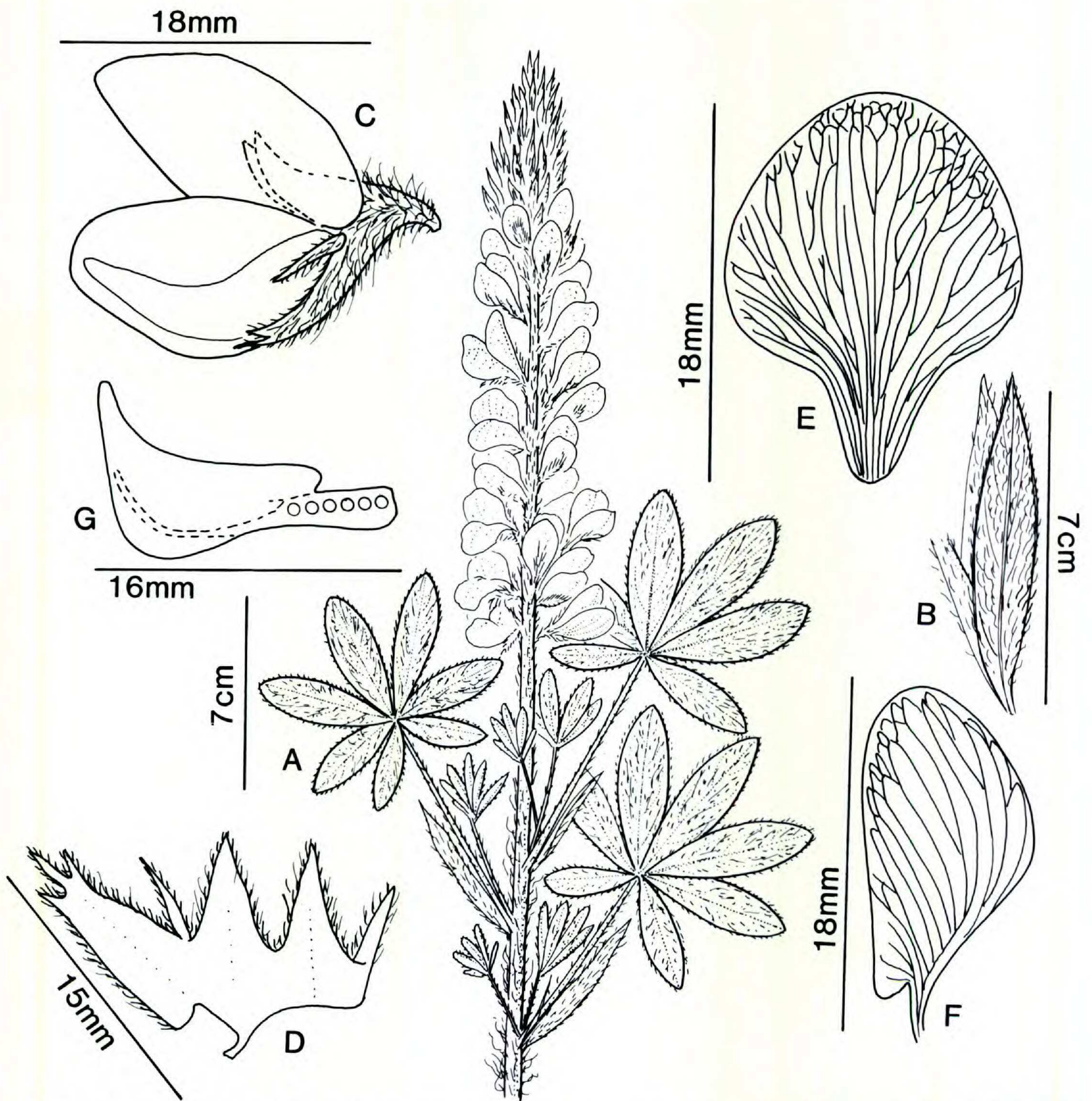


FIGURE 3. Illustration of typical structures of *Lupinus magnistipulatus*.—A. Upper part of the plant with inflorescence.—B. Stipules detached at the node.—C. Lateral view of the left side of the flower.—D. Calyx, cut at the left lateral sinus and opened so that the inside surface shows.—E. Banner petal flattened, dorsal view.—F. Wing petal.—G. Keel petals, enclosing the staminal tube and the pistil, with the mean number of ovules drawn.

Ponte Serrada, by road to Xanxere, 700–900 m, ruderal, *Smith & Klein 13054* (US, SI, fragments); Mun. São Joaquin, Serra do Oratorio, *Reitz & Klein 7417* (SI, US); *Smith & Reitz 10135* (US).

3. *Lupinus setifolius* Planchuelo & Dunn, sp. nov. TYPE: Brazil. Rio Grande do Sul: locality unknown, *Rambo 36208* (holotype, SI; photos, NY, UMO, US). Figure 4.

Plantae probabiliter biennes, 25–30 cm altae; caules erecti, fistulosi, pilis paucis patentibus ornatis; stipulae virides, foliaceae, 5–6 cm longae, parte adnata, 1.5–2 cm longa, parte libera lanceolato-ovata, glabrata, 2.5–4

cm longa, 10–15 mm lata; petioli 6–7.5 cm longi; folia 5–7-palmata, folia juvenalia basi plantae locata et folia prima ramorum lateralium foliolis tribus notata, eis late oblanceolatis; foliola 6–7 cm longa, 20–25 mm lata, apice rotundatis ubique glabris praeter marginem et costam infra pilis patulis setaceis ornatis; racemus densus, floribus diffusis; bractae 13–20 mm longae, 3–5 mm latae, margine setaceo; bracteolae 3.7–4.8 mm longae, 0.8–1 mm latae; flores calycibus in dorso laxe subsericeis, ventraliter glabris, labio inferiore 10–11.3 mm longo, 3–4 mm lato, tridentato, dentibus 2.3–3 mm longis, 0.5–0.8 mm latis, labio superiore 7.5–8 mm longo, bifido, incisura 4.5–5 mm profunda, lobis 1.2–1.5 mm latis, vexillum glabrum, ovatum, 15.5–16.5 mm longum, 11.5–12.5 mm latum, ungue 3–3.5 mm longo, parte reflexa

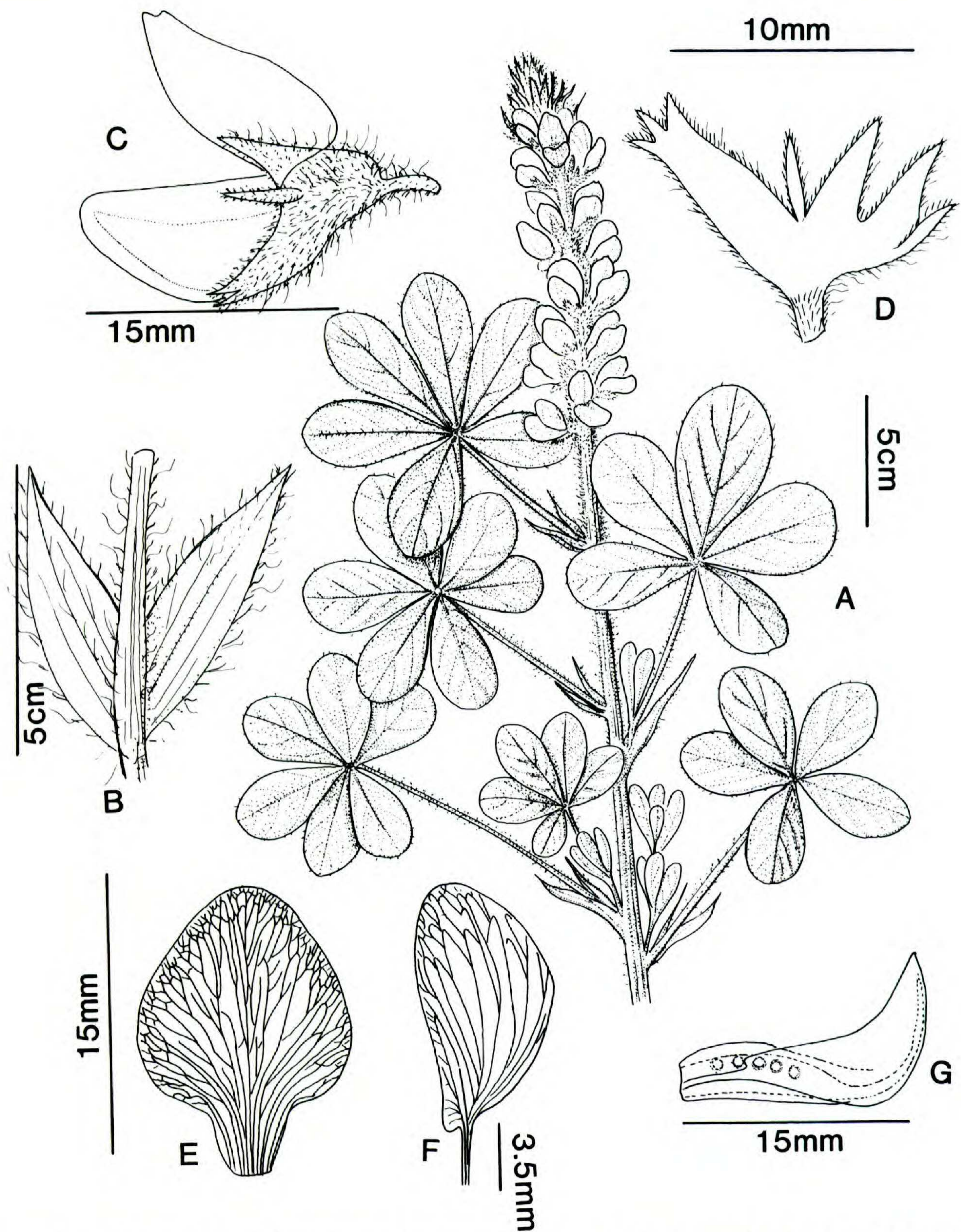


FIGURE 4. Illustration of typical structures of *Lupinus setifolius*. — A. Upper part of the plant with inflorescence. — B. Stipules detached at the node. — C. Lateral view of the left side of the flower. — D. Calyx, cut at the left lateral sinus and opened so that the inside surface shows. — E. Banner petal flattened, dorsal view. — F. Wing petal. — G. Keel petals, enclosing the staminal tube and the pistil, with the mean number of ovules drawn.

11–12 mm; *alae* 16–16.5 mm longae, 5.8–6.5 mm latae; *carina* glabra, 3.5–4.5 mm lata; *ovula* 5–6; legumina non visa.

Plants probably biennial, ca. 25–30 cm tall; *stems* erect, fistulose, 6–7 mm diam., angular from the ridges by veins from the petioles, with scattered spreading hairs 3–4 mm long, these more numerous above; *stipules* foliaceous, 5–6 cm long, the

adnate portion 1.5–2 cm long, the free portion ovate-lanceolate, the tip acute or obtuse, 2.5–4 cm long, 10–15 mm wide, glabrous on both sides except a few hairs on the veins and margins; *petioles* of larger leaves 6–7.5 cm long; juvenile *leaves* at the base of the plant and first leaves of lateral branches with 3 leaflets, the upper leaves with 5–7 leaflets, these broadly oblanceolate, the tips

rounded, glabrous on both sides, except a few spreading hairs on the veins below or on the margin, the largest 6–7 cm long, 20–25 mm wide, mostly complanate. *Peduncle* 5 cm long, with more numerous spreading hairs than the stem; *raceme* (immature) dense, the flowers scattered; *rachis* with denser spreading hairs; *bracts* lanceolate, the tips acuminate, 13–20 mm long, 3–5 mm wide, dorsally pubescent on the veins, glabrous ventrally on the lower half; *bracteoles* 3.7–4.8 mm long, 0.8–1 mm wide, glabrous with margin setaceous, narrowly lanceolate, attached just below the lips of the lateral sinuses of the calyx; *pedicels* 3 mm long at anthesis, spreading pilose. *Calyces* covered with long soft hairs outside, glabrous within, the base tapering but slightly gibbous above, lower lip 10–11.3 mm long, 3–4 mm wide, the tip trifid, all teeth 2.3–3 mm long, 0.5–0.8 mm wide, upper lip 7.5–8 mm long, 4 mm wide, bifid, the notch 4.5–5 mm deep, the lobes 1.2–1.5 mm wide; *banner* glabrous, ovate, the base tapering into a claw, 15.5–16.5 mm long including the 3–3.5-mm-long claw, 11.5–12.5 mm wide, reflexed 11–12 mm, appressed 4–5 mm, reflexed/appressed ratio 2.2–3, the angle double, the lower 132–146°; *wings* 16–16.5 mm long, 5.8–6.5 mm wide, the tip rounded, the claw 3.5–3.8 mm long; *keel* glabrous, 3.5–4.5 mm wide in the middle, the angle 92–109°, the tip not curled back; *ovules* 5–6. *Legumes* not seen.

The description was based solely on the holotype. The taxon appears to be closely related to *L. magnistipulatus*. The flowers are smaller and the base

of the calyx has a ridge above and below at the pedicel, while that of *L. magnistipulatus* tapers more gradually into the pedicel.

Representative specimen examined. BRAZIL. RIO GRANDE DO SUL: locality unknown, Rambo 36208 (holotype, SI; photos, NY, UMO, US).

CONCLUSIONS

The three species, *L. paraguariensis*, *L. albescens*, and *L. aureonitens*, not treated in this paper are included in the key to facilitate identification of presumably closely related species. In seedlings of *L. albescens* grown from an herbarium specimen, the first leaf of the plant was simple and the second three-foliate. This particular characteristic should be common to the group of species treated in the key, although it is difficult to find in herbarium specimens. Considering the taxonomic studies of the genus *Lupinus* for South America (Planchuelo-Ravelo, 1984), this complex and its related species are representatives of the lupines of the "Atlantic Region" and are the only group of perennial plants with large compound leaves growing in the area.

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